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CHEMICAL NOTES ON SOME MALAYAN ECONOMIC PRODUCTS.

By M. Barrowcliff.

Perah Oil.

The "Perah", *Elateriospermum Tapos*. Miq., is a large tree said to be common in the jungles of Perak, Selangor and Pahang, which bears a fruit extensively used by the Sakai tribes as a food and also, I am informed, by the Malays.

Another use to which it is put, according to Cherutti, is as a fish bait, for which purpose the crushed seed is thrown on to a stream and the fish which rise to the surface to take it transfixed with wooden or bamboo spears.

The seeds are oval in shape, are about 1½ inches in length, with a thin shell, and have a pleasant taste.

Those employed in this investigation were kindly collected by Mr. B. H. F. Barnard, Deputy Conservator of Forests, who had been informed that under certain conditions, *i. e.* after being cooked, they possessed poisonous properties. Evidence was obtained in support of this statement by the discovery that a small quantity of a cyanogenetic glucoside, a substance capable of evolving prussic acid, was present in the press cake obtained from them. It seems more probable, however, from a consideration of the nature of the changes by which this class of compounds undergoes decomposition that it is *before* cooking that the poisonous property is manifest and a statement was received from a Malay that bears out this view.

The seeds were found by extraction to contain 39% of an oil, which at the ordinary temperature is a light yellow liquid having little odor and an agreeable taste. About 32 % of oil would be obtainable by hydraulic expression.

The following constants were afforded by the extracted oil

Specific Gravity	.910 at 25° Centigrade
Saponification Value	191.0
Iodine Value	117.2

After saponification it was resolved into "solid" fatty acids (30 %), which proved to be a mixture of equal amounts of stearic and palmitic acids, and "liquid" acids consisting mainly of oleic acid, but associated with which were found linolic, linolenic, and isolinolenic acids. This oil is thus seen to be a non-drying oil of the olive type and would, if readily obtainable, certainly find commercial application, but whether the tree would repay cultivation cannot be estimated until information has been obtained as to the age at which it comes into bearing and the yield. My thanks are due to Mr. A. M. Burn-Murdoch, Conservator of Forests, for his kindness in having the tree botanically identified.

Akar Ipoh Puteh.

H. N. Ridley, in the *Agricultural Bulletin*, No. 8, 1898, describes the plant called by the above name by the Malays and "Bhoi" by the Sakais as being *Roucheria Griffithiana*, Planch., and states that the bark is used by the Sakai for mixing with the antiaris or "Ipoh" when preparing dart poison, but that nothing is known as to its properties.

A specimen of the stem of this plant, which is a woody climber, was obtained for the writer by the Forest Department. Chemical investigation shewed it to contain an alkaloid which was identified as being *brucine*; no strychnine, with which brucine is usually associated, being present.

Mangrove Bark.

The barks of different species of mangrove tree, the wood of which is known in this country as "Bakau," contain varying quantities of tannin and are used to some extent in the leather industry.

Large areas of salt-water swampy land along the coasts of India, Burma, Malaya, Borneo, etc. bear these trees and some years ago (1903) a factory for the manufacture of a tannin extract from them was established by the Forest Department of Burma, but did not apparently (1905) meet with financial success. In Borneo however it is stated to be profitably extracted, but in Malaya only a portion of the bark seems to be utilized for this purpose, mainly by the Chinese.

Analysis of three species of mangrove bark, derived from *Ceriops Candolleana*, *Rhizophera mueronata*, *and Rhizophera conjugata* and known respectively as Tengah, Bakau Kurap, and Bakau Akik, received from the Forest Department, have recently been made and the following tannin content found:—

Tengah 42. 6 % (calc. as oak bark tannin)
Bakau Kurap 29. 1 %
,, Akik 10. 4 %

Although mangrove bark is stated in works on leather manufacture to afford a tannin of poor quality and to be used chiefly for the adulteration of more valuable material it would seem from a recent article on the mangrove industry of Madagascar (*Journal Royal Society of Arts*, Oct. 25, 1912) that a considerable demand is developing for it. The export of bark from that country is given at 137 tons valued at £450 for 1905, while for the year 1910 no less than 36,131 tons valued at £106,000 were shipped. Two species are mentioned in particular as being useful for tanning purposes, the anabovahatra and the tsitolony (the botanical names are not furnished), the first of which is said to contain 60 % of tannin and the second 30 %.

It takes about ten years for a mangrove tree to arrive at an exploitable stage and it is estimated that by working the tsitolony bark the present rate of production can be maintained for four or five years, when it is expected that there will be a decline for an equal number of years, after which the anabovahatra bark, now getting scarce, will again be in a full state of production. Practically all the bark is shipped to Hamburg, from which it would seem that it is from the German tanneries that the demand has risen.

Under these circumstances it should be possible profitably to extract or export the Tengah and Bakau Kurap barks of this country, which must be obtained in large quantites annually as bye products of the firewood industry.

The method employed for making a tannin extract or "cutch" is to cut the bark up into chips or shavings, which are packed into earthen pots containing 3-4 gallons of water and the whole boiled down to one half; the chips are then taken out, the liquid of a number of pots poured into a copper pan and evaporated down until it attains the consistency of syrup, when it is run into a mould. On cooling it sets hard and is then ready for the market.

THE PLANTATION RUBBER INDUSTRY

By Cyril Baxendale,

A Paper Read at the International Rubber Conference in New York.

Early History.

It is remarkable that as civilisation has become dependent on cultivated produce that the profitable cultivation of rubber should have been, for years, open to doubt.

It was in 1876 (not less than 36 years ago) that Hevea seeds were brought from Brazil to Europe by that prince of smugglers, Mr. H. A. Wickham. There was an earlier attempt but as the few seedlings raised, all died, we need not waste time over that, From the 70,000 seeds collected in Brazil by Mr. Wickham, 2,800 plants were raised at Kew Gardens (London) and, in the same year, shipped to the Perideniya Gardens of Ceylon (Ridley tells us) as a depot for the plants from which the cultivation might be spread all over those British Colonies wherein the plant could thrive.

In 1877, a case of 22 plants reached Singapore and were successfully planted by Mr. Murton, the then curator of the newly founded Botanic Gardens there. The same year the first Hevea trees arrived in the Malay States. Two cases were sent from Ceylon to the late Sir Hugh Low (British Resident of Perak) who planted them at Kwala Kangsar, and, I am glad to say he lived long enough to see something of the great success of the industry that he helped to found.

It may seem strange that these trees reached maturity many years before it was realised that they were capable of yielding a sufficient quantity of rubber to make their regular tapping profitable. The only explanation I can offer for this, is that the duty of tapping them was relegated to Sakeis (Malayan Aboriginals) who adopted the same methods they applied to the collection of wild rubber ; that is to say they hacked them with choppers, while the results they achieved were insufficient to tempt any capitalist to put ten cents into the business.

It is to our scientist friends that we owe the primary knowledge of how these trees might be made profitable. On what we now consider to have been a Red Letter day in the year 1888, Mr. H. N. Ridley was appointed director of the Botanic Gardens in Singapore and very soon afterwards commenced experimental tapping, but it was not until 1891 that the first sample of Plantation Para was sent to London, from Malaya and was favourably reported upon by experts. During the nineties, several gentlemen in Ceylon, Mr. Derry and my learned colleague Mr. Leonard Wray—who I am sure we are all pleased and proud to have with us here today—continued the experiments in Malaya.

The first actual sale recorded from Malaya was in 1899 from the trees planted by Sir Hugh Low and realised 3*s* 10*d* per lb. The trees were then 22 years old. To the brothers Kindersley belongs the honour of first planting rubber on a commercial scale in our country. That was in 1895 and within three years the late Mr. W. W. Bailey and several other planters, including the humble individual now addressing you, had summoned up sufficient courage to plant a few hundred acres amongst them. To attribute this slow

development to lack of enterprise would be unjust. If any explanation is required it must be attributed to lack of money. At the time of which I am speaking, we were all coffee or sugar planters, struggling for a bare, very bare, existence. Some of us may have had the privilege of being on terms of a nodding acquaintance with men of means but not many of these could recollect that rubber was useful for any practical purpose except for the erasure of pencil marks.

A favoured few had seen or heard of a Mr. Charles Rolls, travelling in a horseless carriage preceded by an ancient man an foot, carrying a red flag as a danger signal; but, probably, none of these realised that this object of merriment was the forerunner of the greatest mechanical industry of the age or if they did, would not, at any rate, have found it a reason for supporting the schemes of would-be rubber planters.

Rumours of remarkable results from the first planted Hevea trees of Ceylon and Malaya reached Europe and as the years rolled on a few speculative or may I call them, far-sighted persons staked a portion of their savings on the new venture.

The extension of the area under Hevea in Malaya which in 1905 amounted to about 38,000 acres, increased at an average rate from that year of about 70,000 acres per annum. The total area at the end of last year was 542,877 acres.

The Boom

During 1909. the income from the older companies attracted the attention of the investing and speculating public of Europe in general —and Britain in particular—as being unusually large for an agricultural industry—at the same time the value of crude rubber went up by leaps and bounds, bewildering even to those acquainted with the elastic nature of the subject, and indiscriminate speculation was indulged in of which the promoter of many a wild cat proposition took full advantage.

It is said that the boom far exceeded that which heralded railway development 70 years ago, and can only be compared with another that occurred in the reign of our late Queen Anne in connection with a venture known as the South Sea Bubble.

Well, *our* Bubble has since deflated somewhat I am glad to say, but it has not burst; and I think it may be said that the planters who had borne the burden and heat of the day, generally kept their heads in spite of the somewhat embarassing attention paid to their humble efforts, and this had much to do with steadying the market when the bubble was soaring and also in stopping total deflation when investors rushed to the other extreme.

Climatic Conditions.

The reason the Malay Peninsula attracted most attention for this purpose was, primarily, its regular rainfall.

This peculiarity is due to its unique situation as the meeting place of the N.-E. Monsoon of the China Sea and the S.-W. Monsoon of the Indian Ocean. After the subsiding of the rains of the S.-W. Monsoon, the N.-E. commences and as the width of the Malay Peninsular does not exceed 170 miles in any part, the lands on both Coasts are affected by either Monsoon.

I have kept the rainfall records at Jugra for 14 years and have never experienced a month without rain and rarely a month below the average rainfall of Britain. It must be admitted that some of us in cabling particulars of our monthly outputs explain a shortage against the estimate by adding "owing to the drought"; but the truth is we have yet to experience the true meaning of the word "drought." There are very few days in the year when it is too wet to work and this, of course, gives us a great advantage over the collector of wild rubber on the Amazon, where, I understand, there can be no tapping for several months of the year.

Health.

A very considerable change has come over the conditions of life in Malaya. I regret to say that many of the plantations can hardly yet be described as health resorts; but there has been an immonse improvement and in view of the more or less recent discoveries of our medical men there is good reason to hope that the improvement will continue. To Sir Patrick Manson and Professor Ross we owe the original discovery that the Anopheles Mosquito is the principal, if not the only, carrier of malarial infection and the doctors of Malaya have amongst them done excellent work as a result of this discovery. I would single out Dr. Malcolm Watson for special mention, as his work as medical adviser to plantations has come particularly under my notice.

He has discovered that the variety of Anopheles which favours the coast districts, rarely, if ever, travels more than ½ a mile from the jungle and there is practical immunity in dwelling places at this distance.

The valleys, in some of the inland districts, harbour another variety of the Anopheles, the larvae of which exist in running water and can only be got rid of by carrying the water away in enclosed drains. Interesting experiments in this direction are now being carried out by several rubber Companies in Selangor.

Thanks to the natural richness of the soil, a considerable amount of capital was attracted to British Malaya, from Ceylon where there

was comparatively little suitable land available, and our community owes something of its success to the cash and experience introduced from that Colony.

Government and Planter.

Although the new applications for land are still sufficient to tax severely the recourses of our over-worked (and not over-paid) Survey Department the increased rent and export duty has driven a certain amount of British Capital to the Dutch Colonies of Java and Sumatra and considerable development has recently been made in those islands as well as in Borneo.

When stating those facts, I do not wish it to be understood that I am advocating the avoidance of British Malaya as a country for investment, or that I would belittle the fine work accomplished by my fellow-countrymen who have been officially responsible for the development of that region.

On this occasion, I have the honour to represent the Planters Association of Malaya who amongst them manage a total of upwards of 600 plantations with an invested capital of about fifty million pounds sterling, a value which through their efforts has appreciated to several times that amount. I am quite certain that I should not be correctly voicing that community if I conveyed the impression that we would prefer any form of Government than that approved by our Sovereign Lord, King George.

The success of our industry is largely due to the confidence inspired by the existence of an absolutely honest and conscientious public service. Mistakes have been made but those have been due entirely to the excessive zeal of those in authority, who desire that the whole country should participate in the prosperity of our industry; and judging by past experience in times of adversity, we may reasonably expect that if our burdens become too grievous to be borne, we shall obtain the relief necessary to meet the stress of competition.

Cultivation.

With your permission I will now direct your attention to a few details connected with our plantation work.

At first, the cultivation was almost entirely confined to interplanting Hevea trees through the old fields of coffee but a few bold spirits ventured to clear the jungle for this product only. But it is regrettable to mention that some tempered their rashness by planting rubber and coconuts in alternate lines and had to pay rather heavily for their caution, by being forced to cut out either one or the other when both required more room for expansion. I need hardly mention that it was usually the coconuts that were condemned. As

one who does not believe in keeping two good things in a parcel not large enough to hold both, I have planted the two products in adjoining fields; and, perhaps, for that reason, my feelings have always been harrowed by the woeful spectacle afforded by the destruction of thousands of these valuable palms.

The interplanting of *Ficus elastica*—the red rubber of commerce (this has no connection with the rubber shipped from the Congo) was at one time popular, particularly on the estates of the coast districts; but although this variety yielded a fair quantity at the first tapping it did not compare at all favourably with Hevea in continuous yield; and the tapping seemed to check its growth. A considerable area remains under this variety in Sumatra but it has become a negligible quantity in the Peninsula and has never been in favour in Ceylon.

At the outset we obtained our Hevea seeds from the original stock and this was an expensive item which has gradually declined in cost now that we have trees of all ages and have no certain knowledge of any difference in the quality of the plants whether raised from seeds of old or young trees.

In the hilly districts ordinary surface drainage is required but near the coast and on the alluvial flats, great care has to be taken to select land which can be drained efficiently and this work frequently involves considerable expense. Fortunately for us, Malaya is not subject to tidal waves, as large areas of our finest plantations are only a few feet above sea level. The drains are laid out with the compass and cut through the living jungle before felling. The jungle is then cut down and the branches lopped to a level of about 4 feet from the ground. A few weeks later, the burning is carried out by a line of men walking at ten to twenty yards apart, with their back to the wind; and in favourable weather, the undergrowth and smaller branches are consumed. Afterwards, the unburnt branches and small trees are piled and burnt and generally speaking when this is done the field is described as cleared, although the stumps and trunks of the big jungle trees still remain on the land. Recently on some estates, heavy expense has been incurred in getting rid of these, before planting, as a precaution against the spread of root disease and white ants. It is a debated point as to whether the risk of loss by disease, justifies such expensive precautionary measures, and whether it is not better to wait for three or four years when the few rotten logs that remain can easily be got rid of.

Planting is done either from stumps or seed at stake. In the former case, the plants are taken from the nursery, being then from 6 months to two years or even older cut to a length of 3 to 4 feet, the roots hacked back and then planted in the holes previously prepared for them. It says much for the vitality of the Hevea that it usually

survives this drastic treatment and starts to sprout afresh within a month, if the weather is propitious. From this time ensues a battle between the planter and the original jungle which endeavours to regain possession of the land. Numerous kinds of obnoxious weeds—coming from Heaven knows where—also make their appearance. From time tc time, their crops up something almost as bad as weeds I refer to the wearisome controversy as to whether it is not desirable to allow grass to grow or to cultivate some cover plant which will extinguish the weeds. There are one or two cover plants which do not cause any permanent damage and have even proved beneficial on some plantations, when they have lacked sufficient cash to maintain a proper upkeep and when the only alternative was abandonment. I have experimented with small areas under grass but the results have not shaken my belief in clean weeding, to be followed by digging or ploughing whenever there is a sufficiency of funds and labour. With a sufficient supply of these sinews of war, the planter can hold his own and after three or four years, aided by the shade then afforded by his trees, he becomes master of the situation.

The Harvest.

The longed-for harvest then occupies his attention; and now-a-days his thoughts turn, naturally enough, to the curing factory. When I started tapping the word factory had not been invented, or, at any rate, used in this connection. I began by settling the latex in my washing basin, rolling the rubber with a beer bottle (an empty one) and dried it on the verandah. Then acting under strong domestic pressure, I moved the scene of operations to the stables and carried it on there until there was no room for the horse. Next I built a little shed and bought a hand mangle. The next move was to the factory of to-day.

Cost of Production.

You will, I think, be interested to hear something about the cost of production. We planters are frequently twitted about our old promises of cheap production and these are compared with actual costs which in some cases exceed 60 cents (U. S. A. Currrency) a pound. The twitting, curiously enough, was most severe when rubber was worth from two to three dollars, at which time we had to pay an *ad valorem* export duty and charges based on these extremely high prices. Then, as there were not quite enough experienced planters to go round, assistants as well as managers thought they would like to participate in the general prosperity and expected either larger riessala or else commissions. Our coolies also felt that that which was good for master must be good for man, and demanded either more pay or less

work—generally both. Even the Government suffered from the prevailing spirit and on new applications increased the rent and charged a premium on the land. Shareholders often seem to forget to study the other side of the profit and loss account and to compare the price actually obtained against the price we figured on when estimating the cost of production. Moreover we did not contemplate tapping our trees at four years old at which age the rubber is naturally more expensive to collect.

I admit that I speak with prejudice, but it seems to me only right and proper that those responsible for supervision should enjoy some of the fruits of the industry, when the industry can well afford it. There are many other items of expenditure which will automatically decline when the value falls.

Close *vs.* Wide Planting.

I do not desire to encourage the expectation that the yields from our closely planted trees will approach that obtained from those first planted. The latter were usually planted at wide distances and enjoy as much light and air as the heart of tree can desire. Ten years ago I collected 18 lbs. of rubber in 35 days from one of the trees planted by Sir Hugh Low; while from Avenue trees of my own planting, 14 years old and 7 feet in girth, results have been obtained far in excess of those planted in the fields. It is for this reason that I am inclined to deplore references in published reports to yield *per tree*. All calculations should be based upon the yield per acre. Probably the average number of trees planted to the acre in Malaya is nearer 200 than 100 and thinning out is inevitable as the trees expand. Thus, your trees are an uncertain quantity, whereas the acre is always the same.

A well-known botanist who studied the Hevea in its native land used to urge us strongly to plant at 40 × 40 *i. e.* 27 trees to the acre. The Hevea, like most quick growing trees, is extremely brittle; and, at this distance, would suffer severely from the wind but if I allowed, for the sake of argument, that every tree reached maturity, I found by comparing the results from Avenue trees against the results from closely planted fields that up to 8 years old I should have harvested less than half the quantity of rubber from the same area had I adopted our botanical friend's advice.

It is true that I should have economised to a certain extent on the actual cost of collection but not sufficiently to compensate for the loss of rubber.

Thinning out as the trees get older and require more space, has been opposed on the ground that the dead roots encourage the spread of disease. I have pursued this policy for several years past

and cannot find that the fear is justified. Indeed as the years roll on I become less anxious about plant diseases and pests of all kinds. *Fomes semitostus* (our worst fungus disease) and white ants (the most destructive of our insect pests) have lost their terror for me now that I know how to keep them in check and as the loss from all causes on the plantations I am connected with do not average two per cent after attaining maturity, I cannot justly be charged with "turning the blind eye" in that direction.

Labour Prospects.

The most plausible argument against the future output of plantation is that of shortage of labour. It is true that most plantations are at times short of labour but I think this must generally be attributed to the manager's desire to keep down expenses. Out of a total of 227,985 coolies employed on Malayan plantations 126,665, or rather more than half, were imported from India. The average period of service on the plantation does not exceed two years—although many of these return after a holiday in their native land and the difficulty is to engage during the recruiting season the exact number, that are required to make good the probable departures during the rest of the year, without becoming burdened at the beginning with labour for which there is no profitable employment.

Within two years the plantation labour force has more than doubled. I do not believe that by increasing the rate of wages, any great stimulus would be given to Indian emigration. Tamil coolies are more easily recruited for some plantations at half the wages paid on others which are unpopular, owing to unhealthiness or to some other cause: and this fact is becoming more clearly marked, since those employed at the lowest rates have found themselves able to remit more than half their earnings to India and that their savings in three or four years are sufficient to establish them as capitalists when they return to their native villages.

The future success of estates which are unpopular with Indians will depend on the attractions they can offer to Chinese or Javanese. To these, the rate of wages is of more importance than any other consideration and there is practically no limit to the number that can be recruited—at a price.

It must be remembered that by doubling the cost of labour we do not double the cost of production. Generally speaking the average cost of tapping is less than one half the total cost of production, if we include home charges; and as the majority of the trees now being tapped have barely reached half their full yielding capacity, labour rates can, if necessary, be materially increased without raising the cost of production, when the trees attain maturity.

Manuring.

Recently, some consideration has been given to the question of manures. From Ceylon some interesting results have been reported, but in Malaya little has been done in this direction except on some estates where the soil is excessively rich in humus and lime has been applied to correct the acidity, with good results.

My own opinion is that for some years to come, at any rate, systematic cultivation of the soil will be of more value than any manure but the experiments in Ceylon are deserving of attention and the Agricultural Department of Malaya, if it has not already done so, might study the question with advantage.

Future Supplies.

It has been suggested to me that you will be interested in an estimate of the supplies that are to be obtained from plantation sources and it is obvious that a paper of this kind would be incomplete without it. It is not easy to obtain reliable statistics of the cultivation in all the tropical countries in which rubber is grown. Naturally, the yields vary considerably and the high price has undoubtedly encouraged more vigorous tapping on many plantations than would have been considered advisable if the price had been less tempting. I know fields where from 800 to 900 lbs. an acre has been collected for two or three successive years but I question if such high yields can be maintained. A first class, well-managed plantation, may be expected to yield an average of 500 to 600 lbs. an acre for as many years as our experience guides us but we must assume a considerably lower average from all plantations. The area under rubber in the Malay Peninsular at the end of 1911 amounted to 542,877 acres and as far as I can ascertain the total area under this cultivation in the world amounts to about 1,000,000 acres. We know that during the half year ending June 30th the exports from Malaya amounted to 9,038 tons and from Ceylon 2,252 tons. Allowing for the output from India, Sumatra, Java etc. I estimate the total output of plantation rubber will be from 25,000—30,000 tons for the whole year. The annual increase will be fairly steady and at about six years from date the production is likely to amount to 100,000 tons per annum or, in other words equal the total consumption of rubber during the year ending June 30th last.

During the year ending June 30th 1912 with rubber averaging 5/2 (say 1¼ dollars) a pound, consumption—according to the figures recently published by Messrs. Hecht—increased by 25,482 tons—I am aware that this statement has been challenged by other authorities We are told that they are *eminent* authorities but as they unfortunately published their views anonymously, we are obliged to take their word for it.

The most pessimistic of these, that I have read, calculates the increase at about 14,000 tons and if we accept this figure in preference to Messrs. Hecht's (I do not know why we should) and assume that this increase will be maintained, the requirements six years hence will amount to 184,000 tons, so that the struggle between plantation and wild rubber does not appear to be very imminent.

I have now told you, as well as I can, what I believe to be the immediate course of events. To you gentlemen who are manufacturers, I would say this, whether our achievements will lead to prosperity for *our* industry will depend entirely on the growth of *your* industry. Speaking personally of my first few years experience in tropical agriculture, I was engaged in planting coffee. At the outset of my career in this line, the price in local currency and weights was $40 a picul and I saw it fall to $16. This experience is put in the shade by that of my brother planters who were interested in pepper and cinchona. Our misfortunes were due to the fact that an increased supply did not lead to any considerable increase in the demand for these products. We have yet to hear of anyone who shakes the pepper castor more vigorously over his potatoes owing to a slump in the price of pepper or increase his dose of quinine because the quantity of cinchona offered at the auction sale is in excess of anticipations.

The future of the rubber industry depends on whether the planter can confidently anticipate manufacturers digesting the increased supplies.

A well-managed favourably situated *mature* plantation can produce with a handsome profit at 2/6 (60 cents) a pound. It must be remembered that the increased demand depends on the *new* uses to which it may be put, the *increased* demand for uses to which it has hitherto been put and the supply demanded by making good the *losses* by wear.

As an illustration of what I mean, I will take the case of solid and cushion tyres which, if not now, will perhaps shortly, absorb more rubber than is used for any other purpose. If we assume that 1,000,000 of these tyres are used through the world this year and only the same number next year, the amount of rubber required on this account will, other things being equal, be only that amount necessary to replace the loss involved by wear and tear.

The irregularity of the cost has undoubtedly militated against its use in some directions. For instance, I am informed that whereas electric light mains and leads were in the past invariably insulated with rubber, paper insular has been substituted in many cases.

Experts tell me that rubber is preferable for this purpose and no doubt a number of instances will occur to you gentlemen, where it would be preferable did the price admit.

This brings me to the crucial question from the planters point of view and a question which my present audience is in a better position to make an authoritative reply to than any audience previously addressed by a planter.

We can guarantee an enormously increased supply of rubber and will in future years be content with a much lower price than now prevails. What we want to know is whether there is to be a glut in the market and a scramble to sell, with every successive increase in the supply. Perhaps, gentlemen, you can allay the misgivings of those planters with the weaker faith in the future of the industry and can send them through me, assurances which will encourage them to hope for a continuance, even if in a modified degree, of the prosperity we have recently enjoyed—a prosperity which, I believe, has never been rivalled by any agricultural industry in all the history of the world.

THE EXTRACTION OF SUGAR BY MALAYS FROM THE GOMUTI PALM.

By D. G. Deeble.

The Gomuti palm (*Arenga saccharifera*, Lab; *Saguerus Rumphii*, Roxb; *Borassus Gomutus*, *Gomutus saccharifer*, Spr.) is commonly known throughout the Malay Peninsula as Kabong, and is cultivated extensively by the Malays for its saccharine fluid or sap (Menisan). Its principal products are sap and coir. The sap ferments quickly, and is then intoxicating, later it has a dirty whitish appearance, and is usually when in this condition used as vinegar. The coir is superior to that of the coconut both in quality and durability, it is impervious to the wet and is noted for its tensile strength. The heart or interior of the immature fruit is preserved by the Malays and is considered a most edible delicacy. The sugar is commonly known in European households as "Gula Malacca."

The Kabong commends itself to those planters who possess low-lying or swampy land which is totally unfit for the cultivation of rubber, coconuts or cereals, on account of its hardiness and peculiar aptitude to thrive well in such soils. The palm reaches maturity or the tapping stage after the 8th or 9th year, the sign of maturity being when it commences to produce spadices. These sprout periodically and begin from the top of the stem and descend to the base. The number of spadices produced per year is usually six, each spadix yielding sap for two to three months. A fresh spadix always

makes its appearance before the old one is exhausted. A healthy palm will yield on an average three gallons of sap per day of twenty four hours and produces approximately seventy spadices during its lifetime. With the sprouting of the last spadix at the base of the palm, the tree terminates its existence. It produces both male and female spadices. The female produces fruit but no sap, the male produces sap, but, of course, no fruit.

The method employed by the natives to tap the palm is as follows:— On the appearance of the first spadix, the trunk and spadix are beaten twice a day until the flowers open, these are cut away and the liquid is led by means of fibre cords to receptacles placed on the ground to receive it. The beatings continue twice daily until the spadix is exhausted. If the flow stops or decreases, the stem of the spadiix is again cut a little lower down.

The liquid obtained is usually collected in bamboos, these are previously smoked in order to arrest fementation which takes place very quickly if the sap is exposed to the atmosphere for any time or is allowed come in contact with any nitrogenous matter. It is collected every six hours and poured into iron dishes (Kualis), and heated until evaporation causes it to become a thick brownish bubbling syrup, which solidifies on cooling. It is then poured into a series of wooden moulds (Achu-Gula), and allowed to cool. The sugar is then ready for consumption and is sold in the kampong shops at prices averaging from 9 to 12 cents per kati.

The kabong is often planted in European compounds for decorative purposes, it usually grows to an height of 25 or 30 feet, is evergreen and is considered one of the most useful and handsome palms in the East.

HOW TO DISTINGUISH DIFFERENT ORDERS OF INSECTS IN THEIR VARIOUS STAGES.

CHIEFLY ODONATA.

BY C. B. HOLMAN HUNT.

Corrodentia or Psocids. Little can be added to the description of these small insects as given in the previous article. Some of them are wingless and feed inside books, probably on the old paste; they are usually minute, wingless and yellowish white in colour with black eyes. Others, both winged and wingless species, feed on Lichens and usually are to be found crowded together in patches. They are of very small economic importance.

Mallophaga, Bird-lice. Here again the previous description should suffice. These insects feed principally on the feathers and skin of birds, as they have biting mouth parts they differ from the true Lice, which belong to the Hemiptera, possess sucking mouth parts and suck blood.

When fowls are seen to be always shaking themselves and taking "dust baths" they are usually infested with these pests and should be dusted with Pyrethrum or some other Insect powder.

Odonata, or Dragonflies. The general description of this order applies only to the perfect insect. The larva is very different from the imago in its habits, as well as its shape.

While the imago may be seen poised and darting like a winged arrow over any stream or pond catching moths and other insects, scarcely pausing in its flight and dropping the wings and legs of its prey to the ground, the fat "Nymph" lurks in the water below and dashing up to a beetle or even a small fish jerks forward the sharp jaws fixed to the framework hidden below its chest and holds it in a tenacious grip until its prey dies and is torn to pieces and eaten.

The mother Dragonfly lays her eggs in water singly or, more rarely, fixes them to some aquatic plant.

The "Nymphs" start their predaceous habits as soon as they are hatched.

They breathe through the tail end of their alimentary canal by means of water drawn in and expelled; their latter action enables them to dart forward by the force of the jet. Some "Nymphs" have special gill plates also at the end of the body, fitted with an elaborate net work of tracheae and veins, which add to their breathing power. They feed voraciously and are very energetic and cannibalistic too on occasions.

They do much damage in a fish pond, both by attacking the small fish themselves and also by eating up the insect food there.

They move so rapidly that they can rarely be caught themselves by the larger fish.

There are a number of beautifully tinted species in Malaya but unfortunately the colours fade rapidly when the insects are dead so that a collection of them gives a poor idea of their beauty.

From an agricultural point of view the "imagines" do good in the padi fields, as they kill off their stem-boring moths, as they flutter about laying eggs and the water is often seem to be strewn with the wing of their victims. The larvae may do some good, but they probably would prove a hindrance to the introduction of the "millions" fish for the extermination of mosquito larvae.

It is an interesting sight to watch the dragonfly emerging from the nymphal skin which remains attached to the stem of grass or weed long after the imago has flown away.

Euplexoptera or Earwigs may be included here. They possess 2 pairs of wings of which their fore pair are short, hard and leathery and the hind pair large, with radiating veins and folded, when at rest, lengthwise and crosswise. Their mouth parts are biting. The hind end of the body is furnished with pincer like appendages and the metamorphosis is incomplete.

The wings only appear after the last moult. Earwigs are both vegetarian and carnivorous. The eggs are laid in batches and the mother is said to guard them till they are hatched.

MANURIAL EXPERIMENTS WITH YOUNG RUBBER AT KUALA LUMPUR.

By F. G. Spring.

During the past few years there has been considerable diversity of opinion regarding the benefits derived from applications of artificial manures both for rubber and Coconut Estates. This is not surprising considering so little work has been published on the subject and that Rubber cultivation is a recent industry. At the suggestion of the Director of Agriculture, it was decided to conduct a number of experiments at Kuala Lumpur Government Plantation to test the value of different manures as affecting the growth of young rubber. The land on which the tests were made is not ideal for manuring experiments. It was necessary to divide the plots into two sections, namely A and B, as there was not a sufficiently large area of one description of land to carry out the required number of experiments.

The nature of the soil is laterite and would appear to be below the average as regards soil fertility.

Plot A, is fairly flat but probably not as fertile as plot B. Plot B, is undulating, a disadvantage in experiments of this nature as there is a tendency for manures to be washed from one plot to another.

The manures were forked lightly in around the trees to a depth of 2 to 3 inches, between two circles of 1 and 4 feet radius, the tree being the centre of the circle. It is not advisable to spread manures all over the soil in young clearings as the roots do not extend to any distance. In old rubber, or even that newly in bearing, the manures may be broadcast all over the soil.

It will be seen by referring to the tables that the lime was applied about one month previous to the application of Sulphate of Ammonia.

Sulphate of Ammonia should never be used at the same time as lime, as the former may suffer decomposition, with loss by volatilisation of Ammonia, especially in dry weather. It is advisable to allow about three months between the dates of the two applications.

Quick lime was used in each case, the lumps being distributed near the trees and allowed to slake naturally. The lumps soon became reduced to a fine powder and it was found easy to distribute this equally around the trees. One night's rain is sufficient for this decomposition to take place but in dry weather it may take several days. Slaking lime, in this country, in a large heap by adding water does not appear to give such a fine dry powder as the natural process, and the cost of distribution is considerably higher.

The land was weeded once in six weeks, the control plots being weeded as often and treated in a similar way to the manured. This is important as a little extra cultivation in the manured plots would tend to give better growth than in the control if the latter were not treated in a similar way.

The average girth and height of the trees in each plot were taken in October 1911, and remeasured in October of 1912. The increase of girth and height, for the year, will be seen by referring to the tables. The plot in which lime is applied alone shows a good increase in girth compared with the no manure plots, so also do all the experiments in which lime is one of the manures applied.

Bone Meal applied alone shows excellent increases in girth measurements as does Perlis Guano.

It must be remembered that soluble manures such as Sulphate of Ammonia have a short and quick action, extending over a period of months only, while Bone Meal, Superphospbates, Guano, Sulphate of Potash, etc., have an effect for a number of years. It would be impossible to compare the relative value of different manures from the results of one experiment and I would not make any recommendations until a series of experiments have been completed. It is distinctly encouraging, however, to find that all the manured plots show a large excess, for the year, in girth measurements, over the plots which were not manured.

Cost of the Manures and Their Application

Manures are of little value unless the return is sufficiently great to compensate for the cost of their application. In the case of young rubber there is no satisfactory basis to work on, the return being increase of girth and not pounds of rubber. It is evident, however, from the tables, that the return in the form of bringing the trees sooner to maturity, is a considerable one.

The number of trees in each experiment is 120 but the cost of the manures and their application, as seen in the tables, is calculated per acre. I have included the cost of forking in the manures but this expenditure might be excluded as the manures could be forked in, in the ordinary course of weeding.

It will be seen that the returns, in increase of girth, are by no means in proportion to the expenditure. Experiments 9, 10, and 11, (Table B) show a much larger return, in girth measurements, when compared with the relative expenditure in the other plots.

I would like to thank Mr. B. J. Eaton, Agricultural Chemist, F. M. S. for kindly giving advice on several points bearing on these experiments.

The Acting Agricultural Chemist, Mr. Barrowcliff, furnishes the following comments on the results:—The results are quite in accordance with what was to be expected from a consideration of the analytical figures afforded by the soil (which will be published in another connection). These show it to be almost entirely devoid of lime, deficient in phosphate, fairly well supplied with nitrogen and by virtue of a high clay content rich in its stores of potash.

Addition of lime, to correct the acidity and thus bring about a condition more favourable to the action of nitrate forming bacteria would be expected to bring about one marked improvement, and addition of phosphate another.

Less advantage, however, could be hoped for from the use of nitrogen and potash on plots that had also received lime, on account of the latter having already considerably augmented the available supplies of these two substances.

That these considerations are borne out in practice are shown by arranging the results thus:—

TABLE A.

Expt.	*Fertilizer added*	*Increase in girth over trees of the unmanured plots.*
2	Lime, Nitrogen	1.46 inches
4	„ „ Potash	1.33 „
1	„ „ Phosphate	1.87 „
5	„ Potash „	1.87 „
3	„ „ „ Nitrogen	2.35 „

TABLE B.

9	Lime	1.05
7	„ Potash	1.12
8	„ Phosphate	1.87
12	Phosphate, Potash, Nitrogen	1.48

—when it is seen that marked increases can be definitely attributed to lime and phosphate, but that, except in the case of the complete fertilizer, Expt. 3, the influence of potash and nitrogen is indecisive. In future years however further additions of lime may be expected to have less effect than in this, the first one, but those of potash and nitrogen a correspondingly greater.

PADI CULTIVATION IN SIAM.

By E. Bateson.

(Continued.)

From the account given in the previous article on this subject, it will have been seen that Siam, although possessing natural advantages which render it eminently suitable for the growing of padi, must rank as one of the backward rice-producing countries of the world. The absence of irrigation leaves the cultivator at the mercy of the weather, and makes the size of the crop always a matter of uncertainty, and probably also explains the prevalence of the wasteful and comparatively unproductive system of broadcast sowing. Though the methods of preparing the fields are far superior to those practised in Krian, and the use of ploughs and harrows is universal, the implements generally employed are of primitive design, and the influence of Western improvements is only just beginning to be felt. Nothing is done to increase the fertility of the soil, in spite of the fact that some of the land has been cultivated for generations, and would readily respond to the application of manures. Only one crop of padi is grown each year, and the land is very rarely utilised between the padi seasons for the raising of other kinds of produce. Finally, no attempts are made to combat the pests, especially rats, which take a heavy toll of the harvests annually. All these facts are well known in Siam and their importance is fully recognised, and the improvements which are necessary to develop the resources of the country will no doubt be made in the near future.

Siamese Varieties of Padi.

The high reputation enjoyed by Siamese rice is due chiefly to the excellence of the native varieties of padi, and in order that efforts to improve Malayan varieties should be on correct lines, it is important that we should know in what this excellence consists. A variety of padi may be judged from three different points of view,—the cultivator's, the miller's and the consumer's. The chief concern of the cultivator is that the variety shall be a heavy yielder; this question of course does not trouble the other two. Characters

TABLE A.

No. of Trees in each Experiment, 120

No. of Expt.	Manure applied.	Lbs. of Manure	Date of applying Manure	Average girth 1 ft. from ground		Increase in girth	Average height		Increase in height
1	Sulphate of Ammunia Double Superphosphate Lime	½ lb. per tree 1½ lbs. ,, ,, 1000 lbs. per acre	14th Nov. 1911 16th Nov. 1911 21st Sept. 1911	2.35 inches Oct. 1911	7.00 inches Oct. 1912	4.65 inches	5.57 feet Oct. 1911	16.90 feet Oct. 1912	11.33 feet
2	Sulphate of Ammonia Lime	½ lb. per tree 1000 lbs. per acre	15th Nov. 1911 21st Sept. 1911	1.90 inches Oct. 1911	6.04 inches Oct. 1912	4.14 inches	4.91 feet Oct. 1911	15.43 feet Oct. 1912	10.52 feet
3	Sulphate of Ammonia Double Superphosphate Sulphate of Potash Lime	½ lb. per tree 1½ lbs. ,, ,, 1 ,, ,, ,, 1000 lbs per acre	16th Nov. 1911 18th Nov. 1911 28th Nov. 1911 28th Sept. 1911	2.15 inches Oct. 1911	7.28 inches Oct. 1912	5.13 inches	5.56 feet Oct. 1911	16.77 feet Oct. 1912	11.21 feet
4	Sulphate of Ammonia Sulphate of Potash Lime	½ lb. per tree 1 ,, ,, ,, 1000 lbs per acre	16th Nov. 1911 28th Nov. 1911 2nd. Oct. 1911	2.12 inches Oct. 1911	6.13 inches Oct. 1912	4.01 inches	5.5 feet Oct. 1911	15.92 feet Oct. 1912	10.42 feet
5	Double Superphosphate Sulphate of Potash Lime	1½ lbs. per tree 1 lb. ,, ,, 1000 lbs. per acre	18th Nov. 1911 29th Nov. 1911 2nd. Oct. 1911	2.01 inches Oct. 1911	6.66 inches Oct. 1912	4.65 inches	5.36 feet Oct. 1911	17.12 feet Oct. 1912	11.76 feet
6	No Manure			2.35 inches Oct. 1911	5.13 inches Oct. 1912	2.78 inches	6.05 feet Oct. 1911	15.45 feet Oct. 1912	9.40 feet

COST OF THE MANURES AND THEIR APPLICATION PER ACRE.

Expt. (1) $21.00 Expt. (3) $28.00 Expt. (5) $23.50
Expt. (2) $12.50 Expt. (4) $19.50

TABLE B.

No. of Trees in each Experiment, 120

No. of Expt.	Manure applied	Lbs. of Manure	Date of applying Manure	Average girth 1 ft. from ground		Increase in girth	Average height		Increase in height
7	Sulphate of Potash Lime	1 lb. per tree 1000 lbs. per acre	29th Nov. 1911 6th Oct. 1911	2.96 inches Oct. 1911	7.77 inches Oct. 1912	4.81 inches	7.86 feet Oct. 1911	20.17 feet Oct. 1912	12.31 feet
8	Double Superphosphate Lime	1½ lbs. per tree 1000 lbs. per acre	19th Nov. 1911 5th Oct. 1911	2.44 inches Oct. 1911	8.00 inches Oct. 1912	5.56 inches	6.48 feet Oct. 1911	19.00 feet Oct. 1912	12.52 feet
9	Lime	1000 lbs. per acre	13th Oct. 1911	2.73 inches Oct. 1911	7.47 inches Oct. 1912	4.74 inches	6.68 feet Oct. 1911	16.54 feet Oct. 1912	9.86 feet
10	Perlis Guano	4 lbs. per tree	30th Nov. 1911	2.72 inches Oct. 1911	7.65 inches Oct. 1912	4.93 inches	6.86 feet Oct. 1911	17.67 feet Oct. 1912	10.81 feet
11	Bone Meal	3 lbs per tree	30th Nov. 1911	3.11 inches Oct. 1911	8.47 inches Oct. 1912	5.36 inches	7.89 feet Oct. 1911	19.17 feet Oct. 1912	11.28 feet
12	Sulphate of Ammonia Double Superphosphate Sulphate of Potash	½ lb. per tree 1½ lbs. ,, ,, 1 lb. ,, ,,	13th Nov. 1911 30th Nov. 1911 30th Nov. 1911	3.02 inches Oct. 1911	8.19 inches Oct. 1912	5.17 inches	7.46 feet Oct. 1911	18.91 feet Oct. 1912	11.45 feet
13	No Manure			2.71 inches Oct. 1911	6.40 inches Oct. 1912	3.69 inches	6.47 feet Oct. 1911	16.6 feet Oct. 1912	10.13 feet

COST OF THE MANURES AND THEIR APPLICATION PER ACRE.

Expt. (7) $15.00
Expt. (8) $16.50
Expt. (9) $ 8.00
Expt. (10) $ 8.50
Expt. (11) $13.00
Expt. (12) $21.50

such as shape, which matter not at all to the cultivator or the consumer, are of importance to the miller, who is inclined to disregard, within limits, certain qualities which appeal to the consumer but which do not affect the milling of the padi, such as taste and the hardness or softness of the grain when boiled. Considering Siam's great export trade in rice, and that by far the greater part of the padi grown passes through the rice mills of Bangkok, it is not surprising to find that varieties are esteemed according to their suitability for milling purposes.

The following are the chief points which millers in Siam consider requisite in a sample of padi :—

1. The grains should be large.
2. The grains should be long, and cylindrical in shape. Flat "turtle-grained" padi is not liked, as the grains do not roll easily in the polishing machinery and are liable to be broken.
3. The embryo should be small, so that a short "nose" is left when it falls out in milling.
4. The padi should be heavy. Lightness may be due to the grain not filling the husk, or to a low density.
5. The husk should be thin.
6. The soft outside layer of the grain should be thin, and when it is removed the grain should show a high polish.
7. The grains must be translucent all through, not opaque and chalky either wholly or in part. There must be no red grains.
8. The grains must not be broken.
9. The padi should be awnless, that is, it should have no "tail," as a special machine is required to remove this.

Some of the above are varietal characters, but others, size and shape of seed for instance, can be obtained or intensified by seed selection. The weight and quality of padi are influenced to some extent by the nature of the soil on which it is grown. For example, the best-flavoured padi in Siam comes from districts in the south which were formerly liable to inundation by sea water, but if seed from these districts is taken and grown elsewhere, the padi loses its distinctive flavour. Broken grains are caused by carelessness on the part of the cultivator in not cutting the padi when it is ripe, or in leaving it exposed after it is cut. It is liable to be wet by rain, and afterwards, when it is dried by the heat of the sun, the grains crack across within the husk. The cause of opaqueness in grains does not appear to be known. It is associated with a low density —probably to be accounted for by the incomplete filling of the cells with reserve material—and may possibly be connected in some way with nutritional conditions, being due either to some factor inherent

in the plant itself, or, as is more likely to be the case, to the effects of environment. It would be interesting to see if opaque grains could be eliminated by seed selection.

The number of varieties of padi grown in Siam runs into hundreds, if not thousands, and many of them, as would be expected, are of an inferior quality. As illustrating the quality of high-grade Siamese padi, an experiment made a few years ago by Dr. Yai of Bangkok is of interest. He obtained some of the famous "Golden Grain" of Carolina, for which the top price was being received in the European markets; it was planted, and grew quite well and gave a good yield. One of the best Siamese varieties was selected, and was submitted along with the "Golden Grain" to a Bangkok miller, who was given no information about either. The miller tested them, and reported that the native padi was equal in all respects to the "Golden Grain." Dr. Yai naturally concluded that it was not necessary to introduce foreign varieties into Siam; if it was desired to improve the quality of Siamese rice it was only necessary to stop growing the inferior varieties of padi and replace them by those of better quality.

Thére is not doubt as to the superiority of Siamese varieties of padi to the varieties grown in this country, since Siamese rice commands a higher price in the F. M. S. than rice locally grown and milled. It is evident that it would be of great benefit to the cultivators if good varieties of Siamese padi could be introduced into this country, especially in Krian, where the Malays sell their surplus crops to the rice mills, and one of the chief objects of the visit to Siam was to obtain samples of padi to be used as seed. Over forty different varieties were obtained and brought back, including two which received the highest award at Agricultural Exhibitions held in Bangkok. The best of these varieties were selected, and are now being tried in Krian and at Kuala Kangsar, and up to the present they are all growing well. If the experiment proves a success the profits of the padi planter will be increased, and the occupation rendered more attractive to the natives. All the Malays are keenly interested in the merits of different varieties of padi, and they will certainly take up Siamese varieties providing they give good yields.

It is always doubtful, of course, whether introduced plants will thrive in a strange country under new conditions of climate and of soil. But in recent years there have been great advances in our knowledge of hybridisation, and it has been found possible to select desirable characters in plants belonging to different varieties, and by cross-breeding to create a new variety in which these characters are combined. This subject was dealt with in an article by Mr. Barritt in last month's *Agricultural Bulletin*. If therefore the Siamese varieties now being tried prove in some way unsuitable for this

country, they may yet provide valuable material for the Economic Botanist to work upon, and enable him, by crossing with native varieties, to produce hybrids which will grow as vigorously as the native varieties themselves, and at the same time possess the superiority of grain which distinguishes Siamese padi.

Motor Ploughs on Padi Farms.

One of the few lines on which progress has been made in padi cultivation in Siam is the introduction of motor ploughs, though at present their employment has hardly passed the experimental stage. The motors which are being used are oil-driven traction engines of a somewhat antiquated type, which have been adapted to their purpose by a number of ingenious, but none the less amateur, divices. Nevertheless they work well and give very little trouble. The best motors seen were of fifteen horse-power, and were used to pull heavy disc harrows, which ploughed hard clay to a depth of four inches or a little more. With these it was possible to plough two and a half acres a day. Another was a five horse-power motor which pulled a two-furrow share plough.

The cost of ploughing small fields by motor was estimated at $2 an acre, including interest on capital expenditure but not attendant's wages. Large fields, where not much time is lost in turning, can be ploughed for a little less. This is, of course, much cheaper than ploughing in the old-fashioned way with buffaloes or bullocks, and the cost could probably be reduced by using the motors which are specially made for ploughing purposes by firms in England and elsewhere.

It was hoped that after seeing the methods of motor ploughing in Siam, suggestions might be made which would lead to the employment of similar methods in Krian. When the irrigation of this district was commenced a few years ago, the Malays seem to have got the impression that a constant supply of water during the padi season relieved them of the necessity of doing anything to the land beyond clearing it of weeds. In most places the soil is a rich clay, and it happens that much of it is so soft in nature that excellent crops can be obtained from it without ploughing. This lent support to their ideas, ploughing was never started, and now the Malays in Krian are strangers to the practice.

Not all the soil in the district, however, is of the kind mentioned. In some parts the clay, though probably rich in plant food, is too hard to enable the padi to tiller; and in other places there is a superficial layer of peaty substance, below which the roots of the padi cannot penetrate, and which will yield scarcely any crop at all unless it is mixed with the underlying clay. There are some thousands of acres of land of these two descriptions, and if they are to be

of any u se for padi growing they must be ploughed. The owners of the land are, it is believed, gradually coming to realise this as a result of the experiments being carried on in the district, but unfortunately they are the least able of all the cultivators in Krian to bear the expense of buying buffaloes or bullocks and ploughs. If motor ploughs could be introduced into the district their use would afford a ready solution of these difficulties.

It may be urged that it would be unwise to encourage the natural indolence of the Malay by putting machines of this description at his disposal, especially as the great majority of the native holdings in Krian are small enough to be dealt with easily by a plough of the ordinary type. The ideal system in an agricultural district divided into small holdings is for each man to do all the work that is necessary on his own plot of land. By so doing he not only reaps all the profits himself, but also acquires independence of character and habits of industry.

Government has helped to make possible the realisation of this ideal by the establishment of a system of agricultural loans, to be granted to the natives at a low rate of interest and on easy terms of repayment. These loans remove the difficulty of providing capital for the purchase of animals and implements, but the Malay is slow to take advantage of them on his own initiative, and it will probably be many years before the possession of ploughs by the padi planters becomes general.

In the meantime there is no reason why motor ploughs should not be introduced, and the undertaking offers an excellent opening for private enterprise. The idea is well worth the consideration of Chinese business men, rice millers and others, who already have interests in the Krian district. From the standpoint of the cultivator the plan has everything to recommend it; the ploughs would certainly be in great demand, and the investment could not fail to be a profitable one. The expense of ploughing is small, and the increased yield to be expected would be so large as to be out of all proportion to the cost, as may be judged from the fact that experimental plots which were changkolled last year gave four to five times as much padi as they had ever given before.

Ploughing could be done during the whole of the time that the water is off the land, and when the fields are flooded the motors could probably be used for some other purpose. It would be necessary to adopt a fairly light type of motor, the wheels of which would not sink in the peaty soil, but a motor with a 6-7 horse-power engine would not weigh more than a ton. A couple of small portable bridges would be required to enable the motor to be taken over the drain between the road and the padi field, and these, along with the plough, could be carried from place to place on a cart drawn by the motor.

THE NEW YORK INTERNATIONAL RUBBER CONFERENCE.

The Third International Rubber Conference was opened at the Grand Central Palace in New York on September 24th. The conference was called for the purpose of promoting knowledge of crude rubber, and rubber products. Delegates from all parts of the United States the Malay States, Ceylon, Hawaii, the Philippines, Great Britain, Canada, Dutch Guiana, Brazil, Burma, British India, Bolivia, Honduras and British Guiana attended. The Navy Department, the War Dept., the Dept., of Commerce and Labor, the Dept. of the Interior; the Isthmian Canal Commission; the Official Material Testing Bureaus of the principle Foreign Governments also were represented.

The following gentlemen form the Executive Committee:—

President of Conference,	Henry C. Pearson,	New York City.
Honorary Secretary,	Frederic Dannerth,	Ph. D.
Executive Committee,	E. S. Land, U.S.N.	Washington, D.C.
	D. A. Cutler,	N. York.
	Dr. Lothar Weber,	Boston, Mass.
	Dr. W. C. Geer,	Akron, Ohio.
	Dr. S. P. Sharples,	Boston, Mass.
	Dr. Eugenion Dahne,	Brazil.
	C. E S. Baxendale,	Federated Malay States.
	F. Crosbie-Roles,	Ceylon.
	A. Staines Manders,	London.

Proceedings opened with a brief address by the President followed by a paper on "Rubber Contracts" by Mr. Arthur W. Steadman, a leading merchant of New York, with large interests in rubber manufacture. Mr. Cyril Baxendale then read a paper entitled "The Plantation Industry." This was received with loud and prolonged applause.

The President said, that he felt sure that all present would wish him to express their warmest thanks to Mr. Baxendale for the ablest, and most comprehensive paper that had every been written on the subject. He thought it was a wonderful paper. The President then proceeded to pay an elegant tribute to the qualities of the British planter, and to what he described as the splendid organization of the Malayan Plantations.

A very interesting debate followed, in which a number of manufacturers took part. Several of these expressed the fear that chemicals other than acetic acids were used on plantations for the purpose of coagulation.

Mr. Baxendale assured them that to the best of his knowledge only acetic acid is used on reputable estates. It is cheap and

effective, and it would be suicidal to risk damage by using any other. If any other coagulant is in use he felt certain that it was only necessary to issue a warning.

Mr. F. C. Hood, (President of the Rubber Club of America,) expressed his satisfaction with Mr. Baxendale's assurance, and related a personal experience whereby his Company had incurred a very serious loss, attributed to the use of destructive chemicals as a coagulant in plantation rubber. Acetic acid was the only coagulant which he recognized as harmless. He entirely agreed with Mr. Steadman, (the reader of the paper on Rubber Contracts) as to the necessity of revising the nomenclature of all grades of crude rubbers.

PREPARING AND PACKING SEEDS FOR TROPICAL COUNTRIES.

By W. L. Wood.

The following paragraphs are taken from the 1905-6 & 7 Annual Reports, issued by the Government Plantation Department, State of Perak, results of trials on imported seeds as ordinary parcels and in hermetically sealed tins.

In the Annual Report for 1905, para 8., J. W. Campbell writes.—

"There was some controversy in the Horticultural press this year as to the best method of preparing and packing seed far despatch to tropical countries. Some authorities consider it necessary to prepare the seed by a special drying process and to pack them in hermetically sealed tins from which the air is exhausted, to preserve them from the effects of heat and moisture during the journey. Seeds distributed from the Royal Gardens Kew, are not prepared in this way, being merely placed in packets and packed in ordinary wooden boxes or placed in canvas bags. The results are usually satisfactory. It was stated that English garden vegetable seeds would not stand this treatment and to test this, the Kew authorities sent me, amongst others, forty-three packets of English vegetable seeds for trial and report, The seeds sent per parcel post arrived on the 12th May and were sown at once. With the exception of one packet of parsnips, there was not a single failure. The crops of peas from this lot (four varieties) were the best of the year. The result of this trial was decidedly against special drying and packing, but it would perhaps be unwise to give a definite decision on the result of one trial, and it is intended to repeat the experiments in 1906.

"The question is an important one for purchasers of seeds in the tropics, as the cost of specially drying the seeds, air tight cases etc.,

has to be borne by the buyer. The excessive drying also seems to affect some crops, particularly the large seeded ones."

In the Annual Report for 1906, para. 10, T. W. Main writes—

"In continuation of the experiments carried out last year I had a consignment of vegetable seeds sent out from Glasgow, packed as for home delivery i. e. the seeds were put in ordinary paper seed packets, and packed as an ordinary brown paper parcel. They arrived safely and the seeds were sown in due course. Those sown showed a germination of 85%, an excellent result, which proves that special drying and packing in air-tight tins is an unnecessary expenditure, which at present is borne by the buyer.

"It is intended to repeat the experiments in 1907, as the results will be of great value to authorities at home and purchasers in the tropics owing to the special drying process affecting the germinating power of the seeds, especially those with large embryos."

In the Annual Report for 1907, paras 8. & 9, T. W. Main writes :—

"During the year I have further proved that it is quite unnecessary to subject flower and vegetable seed to a special drying process before despatching them from England to tropical countries. The drying process has a detrimental effect on the germinating powers of most seeds.

"During the year I made several test sowings which I think prove this. Seeds from ordinary paper packets which had been packed in brown paper parcels were sown at the same time as others which had been specially dried and packed in hermetically sealed tins, with the result that the former showed a germination of 85 per cent while the latter did not exceed 55 per cent. It seems to me that the only people who benefit from this process are the seed merchants at home, while the buyer suffers by having the germinating power of his seeds considerably reduced by the special drying process which he has also to pay for."

It is evident from the above reports, that it is quite unnecessary to treat seeds intended for Tropical countries before export, and on the result of these trials both vegetable and flower seeds, have since been sent out as ordinary parcels. Germination has been most successful in every consignment; the average being from 80 to 90 per cent. Moreover this average decreases but slightly for about three months; after which the seeds rapidly deteriorate. In the event of a business as seedman being established in the Federated Malay States, then, perhaps it would be necessary to import seeds in hermetically sealed tins, to prevent loss of vitality from exposure during the time they would be kept in stock, unless a quick sale was reckoned on, since it has been proved that three months is the limit for good germination results. Then again this limit is for the Hills

at an altitude of 3,400 feet, and on the plains it would be considerably less, so that those intending to purchase seeds of vegetables and flowers cannot do better than send direct to a good firm in Europe.

Acclimatization is sometimes spoken of in relation to improving the stamina of English flowers and vegetables. It may be so in the colder parts of India, although no signs of this have been seen in the results from seeds, supposed to have been grown in India. In the F. M. S. no such thing is brought about, on the contrary, every one will agree that all imported seeds deteriorate rapidly and that those from the third generation are practically worthless, speaking of annuals generally, and that to get good results they must be renewed constantly. During the past two years, seeds of so called acclimatized vegetable were purchased from several good firms in India, with views of better results from possible acclimatization. Germination was carefully watched and compared with those from Europe. No better results were obtained, in fact worse, and no improvement in quantity or quality was seen in the vegetables, thus showing that this theory is purely sentiment. It is generally understood that seedsmen do not grow all their stock, although they sometimes advertise as doing so, and this was shown when an Indian firm of good repute by mistake included in a consignment for Taiping Hills, a packet of vegetable seeds from a well-known firm in England. Not one quarter of the seeds sold in England are actually grown there, a bad season often spoils whole crops and the seedsman must keep up his reputation, so that other countries are called upon to supply the English markets. Germany probably exports most. To sum up it is proved from several years' experience that nothing is gained by importing specially treated seeds for the tropics, and that the so called acclimatized seed is purely a myth, and that the best results are obtained from those grown in natural climates and exported under normal conditions.

NEW YORK EXPOSITION.

The Rubber Growers' Association, Gold, Silver and Bronze Medals.

The following is a list of the awards made at the New York Exhibition in the competition for the Medals presented by the Rubber Growers' Association, London. In addition to the awards which were actually made to Highlands and Lowlands Estate (F.M.S.), Rosehaugh Estate (Ceylon), and West Country Estate (F.M.S.), who received respectively the Gold, Silver and Bronze Medals and diplomas, the jurors recommended seven other exhibits for additional medals and for diplomas; of these latter six were from the F.M.S. and one from Ceylon.

Catalogue No.	
8	HIGHLANDS & LOWLANDS ESTATE, First Award. Smoked Sheet. GOLD MEDAL.
123	ROSEHAUGH ESTATE, CEYLON. SILVER MEDAL.
73	WEST COUNTRY ESTATE, F.M.S. BRONZE MEDAL.
5	KLANANG ESTATE, F.M.S. Smoked Sheet. Highly Commended.
15	BUKIT RAJAH ESTATE, F.M.S. P. R. Crepe. Highly Commended.
107	MADDAGEDERA ESTATE, CEYLON. Crepe. Highly Commended.
56	CICELY ESTATE, F.M.S. Paleth in Crepe. Commended.
9	HIGHLANDS & LOWLANDS ESTATE, F.M.S. Unsmoked Sheet. Commended.
18	BATU CAVES ESTATE, F.M.S. Smoked Sheet. Commended.
71	THE WEST COUNTRY ESTATE, F.M.S. Commended.

NOTES ON THE SINGAPORE MARKET FOR STRAITS PRODUCE DURING NOVEMBER, 1912.

The depression in Produce Markets generally mentioned in the last report continued during November, there being an almost entire absence of speculative demand with the consequence that prices declined still further.

Peppers—Johore Black Pepper is not obtainable at present, the new crop, which is expected to arrive in January is said to be of about average quantity, and as weather conditions have on the whole been favourable, the quality should be good. A small business has been done in Singapore Fair at $20, but there are now no buyers above $19⅝. Sarawak White Pepper after a sharp advance to $34½ is flat again at $33 buyers, $33½ sellers. This crop also is practically finished. Fair quantities of Sambas and other White Peppers of the same description have arrived, and fetched prices from $33½ to $35 according to quality.

Gambier—Demand continues very poor and with rather excessive supplies, the price shows a further decline, business having been done as low as $7.75.

Copra—This article only has shown some signs of life, as there has been an active demand locally for ready parcels, due no doubt to "bears" covering their November commitments. European markets keep quiet with sellers of forward shipment at much below current prices here which close at $11.60 for good S.D., $11.40 Bally, $11.10 Kayong, $11 Pulo, and Siantan $10.70.

Rubber—has recovered in sympathy with firmer advices from home markets.

Closing values were as follows, viz:

Fine Pale Crepe	$229	per picul
No. 2 ,,	$215	,,
Smoked Sheet	$233	,,
Unsmoked Sheet	$215	,,
Scrap	$150/140	per picul.

The demand at present is for Smoked Sheet principally and high prices were paid for good parcels.

Inferior Crepe has also been in good demand.

Tapioca—Prices have been steadier during the period under review, but there is little business doing on the article.

Closing values are Small Flake $7.65 and Pearl $7¼ per picul.

Nutmegs—Values have declined since last advices and market closes weaker at $30 and $28 for 80s and 110s respectively.

Sago Flour—has been very steady with very slight fluctuation.

Supplies are about normal and with only a moderate demand, values at the close are easier.

We quote $3.90 to $3.95 according to quality.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported during the Years 1912 and 1911.

Produced in	Exported during Oct. 1912.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.
	lbs.	lbs.	lbs.	lbs.	lbs.
Perak	1,038,989	7,308,919	8,347,908	4,307,177	4,040,731
Selangor	1,585,148	13,019,322	14,604,470	8,278,431	6,326,039
Negri Sembilan	580,684	4,291,731	4,872,415	2,835,124	2,037,291
Pahang	6,010	81,810	87,820	22,422	65,398
Total ...	3,210,831	24,701,782	27,912,613	15,443,154	12,469,459

Exported viâ	To United Kingdom.		To Continent of Europe.		To Ceylon.		To America.		Total.	
	Oct.	To date.	Oct.	To date.	Oct.	To date.	Oct.	To date.	Oct.	To date
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Port Swettenham	1,435,523	13,810,146	207,291	1,886,125	81,627	720,541	...	23,413	1,724,441	16,440,225

Note:— To Australia and Japan nil.

KUALA LUMPUR,
11th November, 1912.

E. S. HOSE,
Acting Commissioner of Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of the State of F. M. S. for the Month of November, 1912.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bharu	...	146.79	80.9	86.29	74.77	11.51	77.1	.857	74.6	81.%	...	9.63	1.44
Malacca, General Hospital	29.882	146.3	81.	86.7	72.7	14.	78.6	.943	...	89.	N. W.	10.43	1.81
N. Sembilan, Dist. Hospital Seremban	...	149.2	79.6	87.1	71.9	15.2	76.1	.834	73.8	82	N. W.	13.11	2.68
,, Dist. Hos. K. Pilah	...	...	79.9	89.8	72.2	17.6	76.5	.848	74.2	83	...	11.21	2.09
,, ,, Tampin	...	158.0	79.4	85.8	73.7	12.1	75.6	.818	73.1	81	...	6.10	0.80
,, ,, P. Dickson	...	155.9	80.6	86.9	74.1	12.8	76.7	.845	74.1	80	..	18.16	4.47
Pahang, ,, K. Lipis	...	...	78.8	88.7	68.3	20.4	76.0	...	...	...	...	18.68	3 30
Penang, ,, Penang	29.851	154.	81.5	91.	73.	18.	77.	.867	74.0	81	...	10.96	3.40
Perak, ,, Taiping	...	107.	80.3	93.	71.	22.	76.35	.860	...	85	...	22.34	3.30
,, ,, Ipoh	...	...	80.75	92.	71.	21.	76.06	.837	...	80	...	15.06	3.61
,, ,, T. Anson	...	...	80.83	91.	70.	21.	76.53	.857	...	82	...	12.20	2.02
,, ,, P. Buntar	...	...	80.59	90.	72.	18.	76.54	.860	...	82	...	12.18	2.84
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	47.11	5.64
Selangor, General Hospital Kuala Lumpur	...		81.2	87.3	71.5	15.18	77.	.880	72.2	79	...	14.26	2.64
,, Dist. Hos. Klang	...	...	...	88.2	68.2	20.	...	...	...	...	...	9.23	1.50
,, ,, K. Selangor	...	...	...	87.0	69.6	17.4	...	...	...	...	...	11.10	1.42
,, ,, Rawang	...	...	...	90.0	71.6	18.4	...	...	...	...	...	12.71	3.57
Singapore, Kandang Kerbau Observatory	29.559	155.0	82.3	90.6	72.6	18.0	77.1	.882	...	76	S. W.	10.02	2.87